ATAVRAUTO100

User Guide

Section 1
Introduction

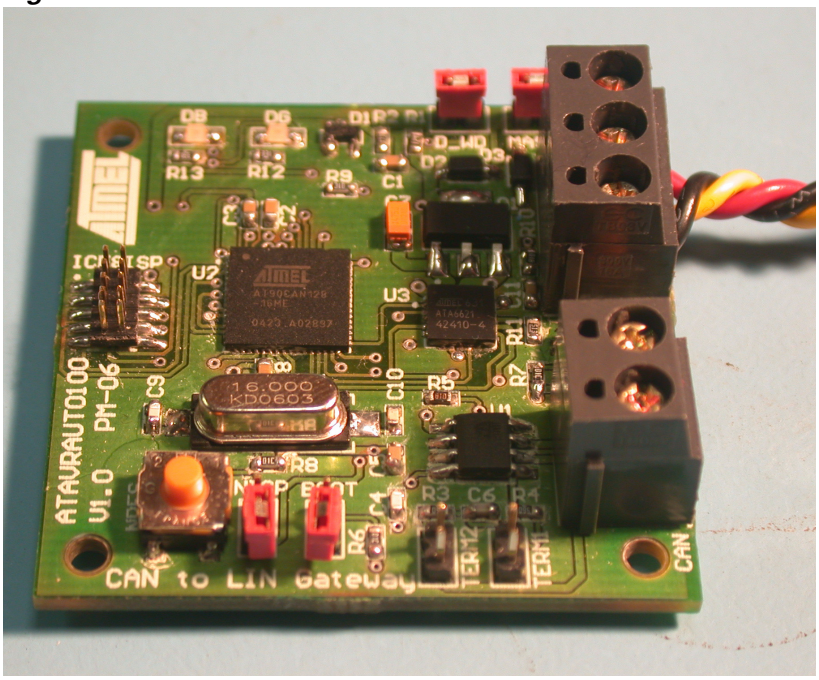
Congratulations on your selection of the ATAVRAUTO100. This board includes all elements necessary for designers to quickly develop code related to CAN and LIN communication gateway implementing the AT90CAN128 and for prototyping and testing of new designs.

1.1 Overview

This document describes the ATAVRAUTO100, a board providing CAN and LIN networking resources. The AT90CAN128 AVR micro controller supports both the CAN and LIN protocols: the ATA6660 and ATA6621 are ideally suited for CAN and LIN physical connections.

This user guide acts as a general getting started guide as well as a complete technical reference for advanced users.

Figure 1-1. ATAVRAUTO100



1.2 ATAVRAUTO100 Features

The ATAVRAUTO100 provides the following features:

- AT90CAN128 QFN64,
- AVR Studio software interface *(Note:)*,
- Power supply:
  - regulated 5.0V out of the VBAT (typical 12V) from the LIN connector
- JTAG connector:
  - for on-chip In Situ Programming (ISP)
  - for on-chip debugging using JTAG ICE
- Serial interfaces:
  - 1 CAN interface (High Speed and Low Speed)
  - 1 LIN interface 1.3 and 2.0 compliant (Software library available on the Atmel website for LIN 1.3).
- On-board resources:
  - 1 high speed CAN transceiver ATA6660
  - 1 LIN transceiver ATA6621 implementing one 5.0V voltage regulator and a watchdog
  - 1 blue LED
- 1 Jumper to add a 1KΩ pull-up resistor when Master mode is selected (LIN)
- On-board In Situ Programming jumper
- System clock:
  - 8 MHz crystal
- Dimension: 45 mm x 45 mm

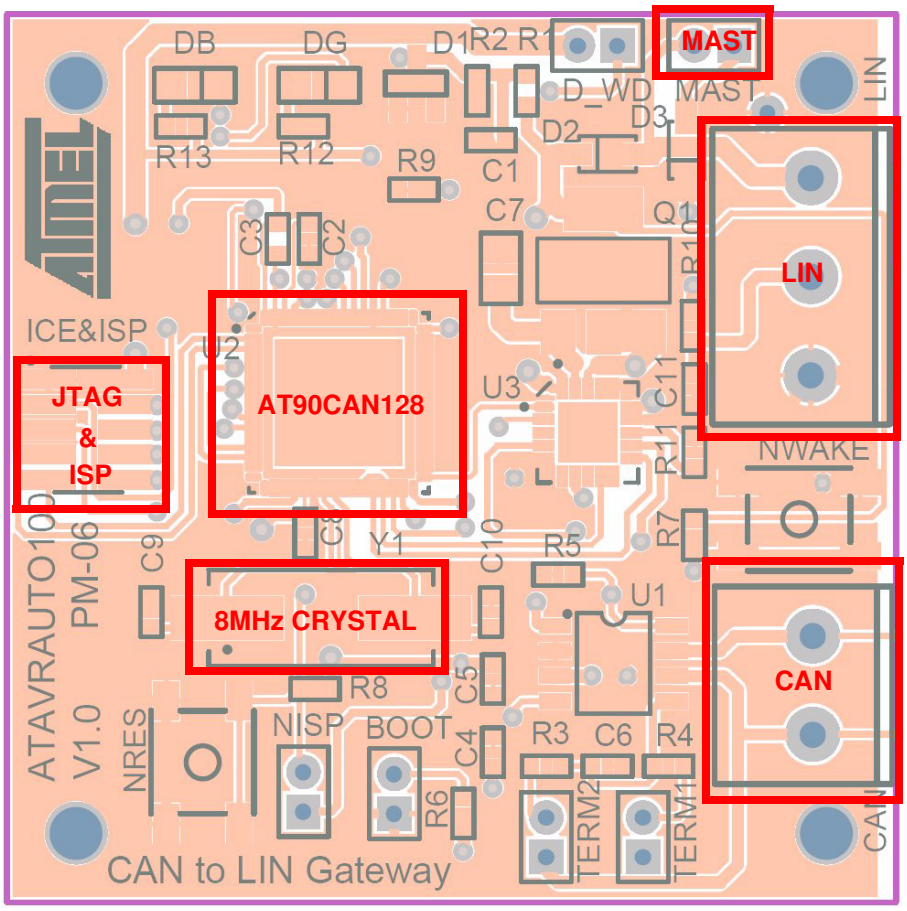
Note: The AT90CAN128 is supported by AVR Studio, version 4.12 or higher. For up-to-date information on this and other AVR tool products, please consult our web site. The newest version of AVR Studio, AVR tools and this user guide can be found in the AVR section of the Atmel web site, http://www.atmel.com.

Section 2

Using the ATAVRAUTO100

2.1 Overview

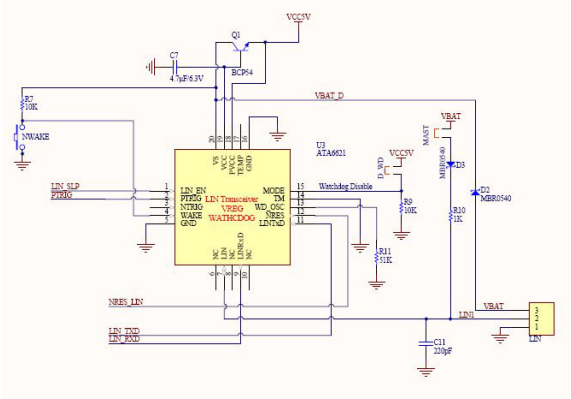
Figure 2-1. ATAVRAUTO100 Overview

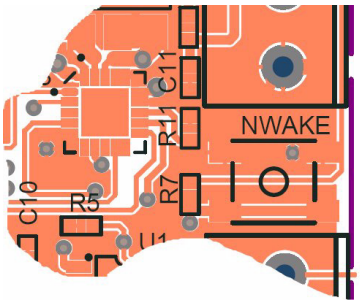


2.2 Power Supply

The on-board power supply must be provided via the LIN connector. The ATAVRAUTO100 has been designed for operating voltage from 7V to +18V with typical voltage at 12V. The LIN transceiver ATA6621, connected to the LIN network, has an internal voltage regulator which outputs 5.0V ±3%. This voltage is used to power the AT90CAN128 device.

Figure 2-2. The LIN power line is used to bias the ATAVRAUTO100





Note: A LIN network has to be connected to have your LIN interface working (Input supply from 7 to 18V DC).

2.3 Oscillator Sources

The ATAVRAUTO100 allows two oscillator sources:

- Internal RC oscillator
- External crystal (Default setting configuration)

2.3.1 Internal RC oscillator

The calibrated internal RC Oscillator provides a fixed 8.0 MHz clock. The frequency is nominal value at 3V and 25°C. If 8 MHz frequency exceeds the specification of the device (depends on VCC), the CKDIV8 fuse must be programmed in order to divide the internal frequency by 8 during start-up. The device is shipped with the CKDIV8 fuse programmed. See “System Clock Prescaler” on page 41 for more details. This clock may be selected as the system clock by programming the CKSEL fuses as shown in Table 11. If selected, it will operate with no external components. During reset, hardware loads the calibration byte into the OSCCAL Register and thereby automatically calibrates the RC Oscillator. At 5V and 25°C, this calibration gives a frequency within ±10% of the nominal frequency. Using calibration methods as described in application notes available at www.atmel.com/avr it is possible to achieve ± 2% accuracy at any given VCC and temperature. When this Oscillator is used as the chip clock, the Watchdog Oscillator will still be used for the Watchdog Timer and for the Reset Time-out.

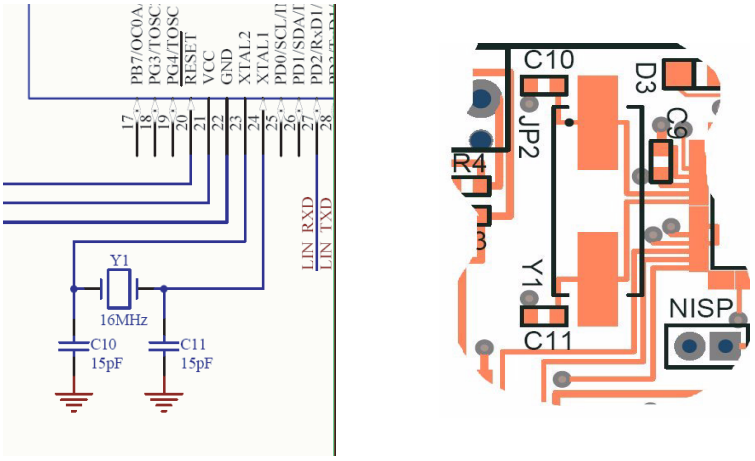
Note: The internal RC oscillator can not be used to operate the ATAVRAUTO100 for CAN operations. Only LIN Slave mode with a run-time oscillator calibration can be used with the internal RC oscillator.

2.3.2 External crystal

Necessary for the CAN network precision, the following crystal frequency allows proper ATAVRAUTO100 operations(1): 8MHz, 12MHz, 16MHz. The ATAVRAUTO100 comes with a default 8MHz crystal oscillator (CAN baut rate up to 1MBit/sec).

The LIN master mode clock should always be a crystal or external clock oscillator. Currently, only 8MHz and 16MHz crystal oscillator is supported.

Figure 2-3. Crystal Oscillator connection.



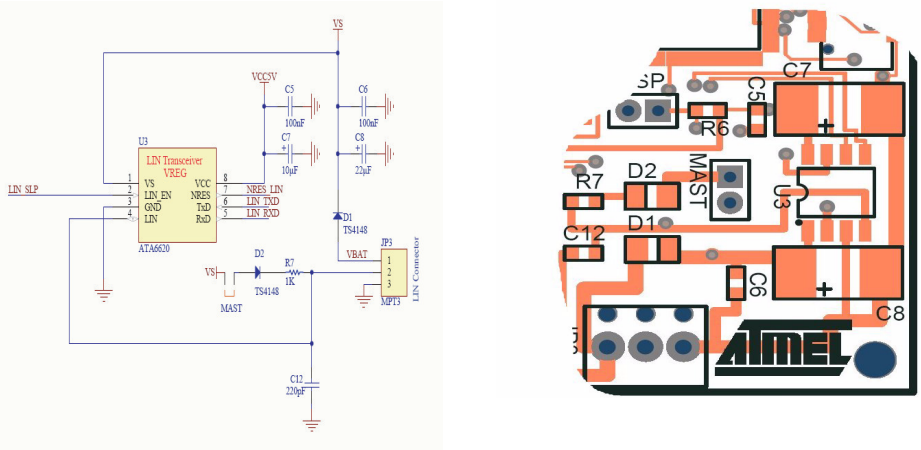
Note: Only the 8MHz and 16MHz frequency are supported by the CAN and LIN libraries

2.4 On-board ressources

2.4.1 LIN

Connection to the LIN network is made via the LIN connector JP3. The LIN signal must be connected to the pin 2 of the connector.

Figure 2-4. .LIN And Power-supply Connections to JP3



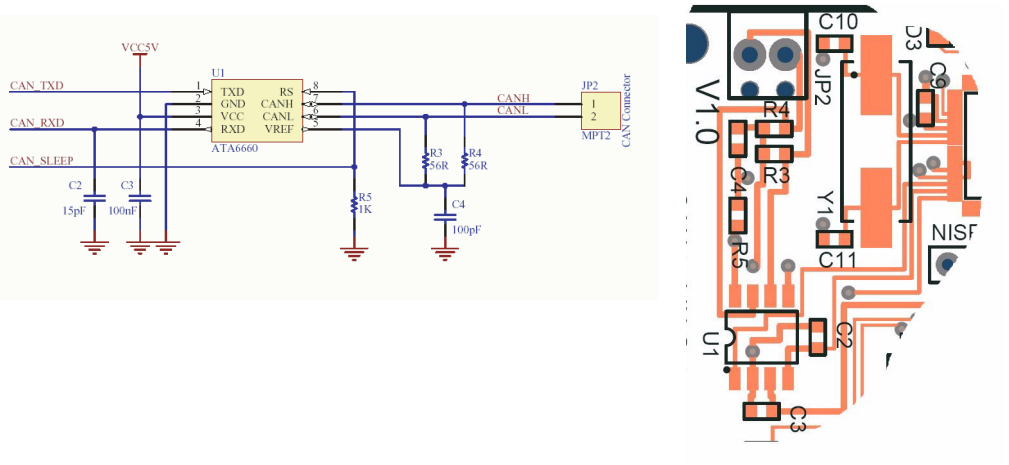
2.4.2 LIN MASTER selection

To operate the LIN in Master mode, one 1kΩ resistor must be placed at the Master connection. To do so, the MSTR jumper must be positionned as indicated in Figure 2-4.

2.4.3 CAN

Connection to the CAN network is made via the CAN connector JP2. Only the CAN- and CAN+ are connected. The signals are routed to ATA6660 CAN high speed transceiver.

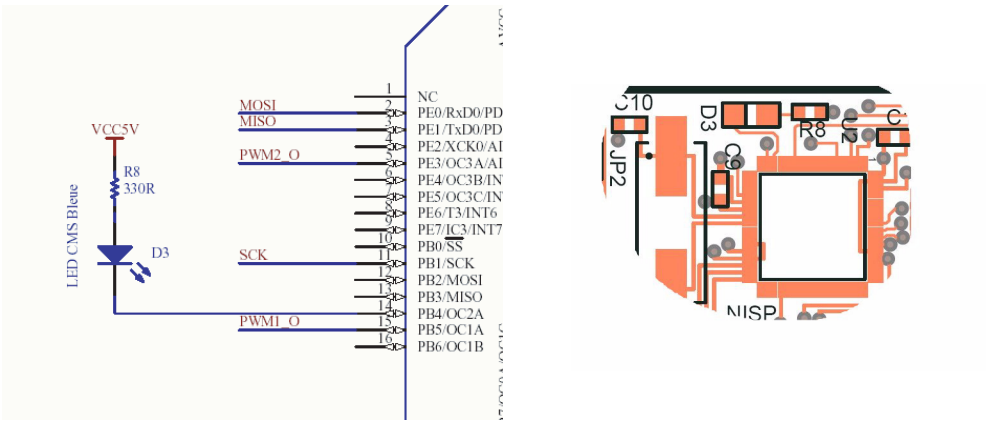
Figure 2-5. CAN High Speed connections



2.4.4 LED

The blue LED is illuminated when the ATAVRAUTO100 is correctly powered, i.e. voltage higher than +5V is present on the LIN connector.

Figure 2-6. VDD presence is indicated via the blue LED illumination.



2.5 In-System Programming

The AT90CAN128 can be programmed using specific SPI links. This sub section will explain how to connect the programmer.

The FLASH, EEPROM memory (and all Fuse and Lock Bit Option ISP-programmable) can be programmed individually or with the sequential automatic programming option.

Note: When programming, the NISP jumper has to be removed.

2.5.1 Using the ATAVRAUTO900 Adaptator

The AVR ISP programmer is a compact and easy-to-use In-System Programming tool for developing applications with AT90CAN128. Due to the small size, it is also an excellent tool for field upgrades of existing applications. It is powered by the ATAVRAUTO100 and an additional power supply is thus not required. The AVR ISP programming interface is integrated in AVR Studio®. An additional adaptator has to be used to program the board using ISP or JTAG mode. The 10 pins connector is used for the JTAGICE mkII device and the 6 pins connector is used for the AVRISP device. To plug the ATAVRAUTO900 connector to the board, the arrow (on the adaptor) has to be in front of the point (on the board).

Figure 2-7. ATAVRAUTO900 Connection

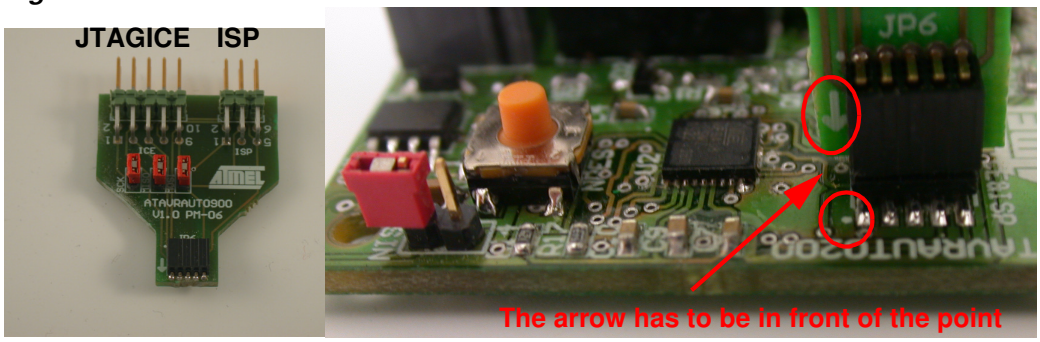


Table 2-1. ICE Connector

PIN	Function
1	TCK
2	GND
3	TDO
4	VCC
5	TMS
6	NRES

Table 2-1. ICE Connector

PIN	Function
7	VCC
8	NC
9	TDI
10	GND

Table 2-2. ISP Connector

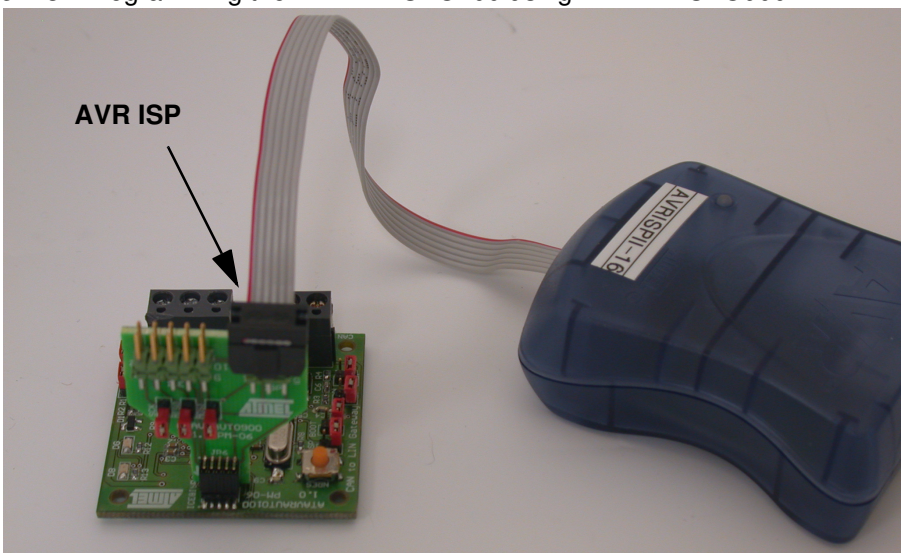
PIN	Function
1	MISO
2	VCC
3	SCK
4	MOSI
5	NRES
6	GND

2.5.2 Programming with AVR ISP via SPI

Both the Flash and EEPROM memory arrays can be programmed using the serial SPI bus while RESET is pulled to GND. The serial interface consists of pins SCK, MOSI (input) and MISO (output). After RESET is set low, the Programming Enable instruction needs to be executed first before program/erase operations can be executed. Note that throughout the description about Serial downloading, MOSI and MISO are used to describe the serial data in and serial data out respectively. For AT90CAN128 these pins are mapped to PDI (PE0) and PDO (PE1).

To program the device using AVR ISP programmer, connect the AVR ISP to the adaptor (ATAVRAUTO900) and connect the adaptor to the connector of the ATAVRAUTO100.

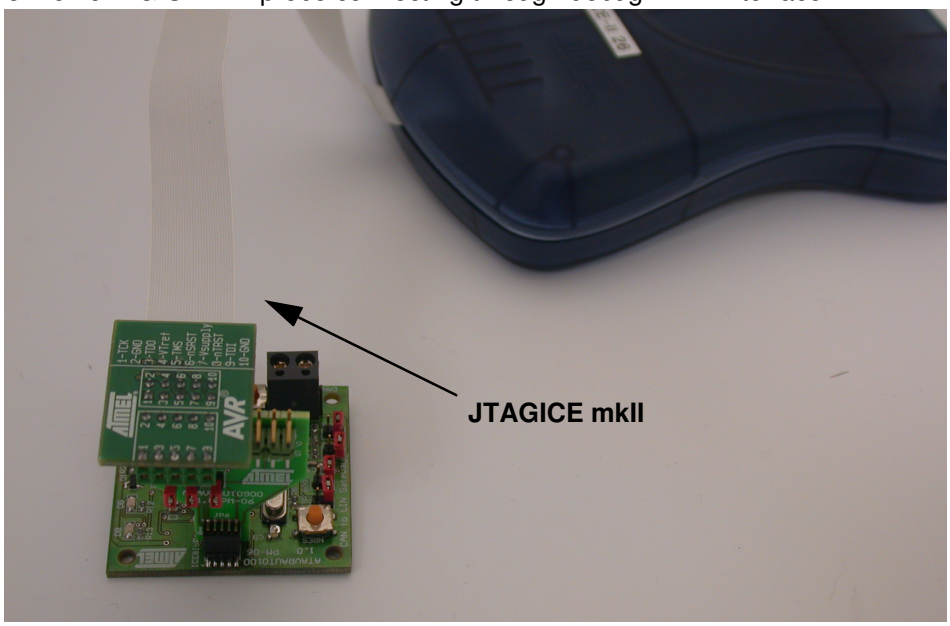
Figure 2-8. Programming the ATAVRAUTO100 using ATAVRAUTO900



2.5.3 Programming with AVR JTAGICE mkII

The AT90CAN128can be preogrammed using specific JTAG link: 3-wire debug-wire interface. To use the AVR JTAGICE mkII with an ATAVRAUTO100 an optional adaptor should be used. Then the JTAG probe can be connected to the ATAVRAUTO100 as shown in the following figure.

Figure 2-9. JTAGICEmkII probe connecting through debugWIRE interface.



2.6 Debugging

2.6.1 Debugging with AVR JTAGICEmkII

The JTAGEN fuse must be programmed to enable the JTAG Test Access Port. In addition, the OCDEN fuse must be programmed and no Lock bits must be set for the Onchip debug system to work. As a security feature, the On-chip debug system is disabled when either of the LB1 or LB2 Lock bits are set. Otherwise, the On-chip debug system would have provided a back-door into a secured device.

The AVR Studio enables the user to fully control execution of programs on an AVR device with On-chip Debug capability, AVR In-Circuit Emulator, or the built-in AVR Instruction Set Simulator. AVR Studio® supports source level execution of Assembly programs assembled with Atmel Corporation's AVR Assembler and C programs compiled with third party vendors' compilers.

AVR Studio runs under Microsoft® Windows 95/98/2000/NT/XP. For a full description of the AVR Studio, please refer to the AVR Studio User Guide.

Section 3

Technical Specifications

- System Unit
  - Physical Dimensions.....L=45 x W=45 x H=8 mm
  - Weight .....17 g
- Operating Conditions
  - Internal Voltage Supply 5.0V
  - External Voltage Supply .....7V -18V

Section 4

Technical Support

For Technical support, please contact avr@atmel.com. When requesting technical support, please include the following information:

- Which target AVR device is used (complete part number)
- Target voltage and speed
- Clock source and fuse setting of the AVR
- Programming method (ISP, JTAG or specific Boot-Loader)
- Hardware revisions of the AVR tools, found on the PCB
- Version number of AVR Studio. This can be found in the AVR Studio help menu.
- PC operating system and version/build
- PC processor type and speed
- A detailed description of the problem

Section 5

Complete Schematics

On the next pages, the following documents of ATAVRAUTO100 are shown:

- Complete schematics,
- Bill of materials
- Assembly drawing

Figure 5-1. ATAVRAUTO100 Schematic

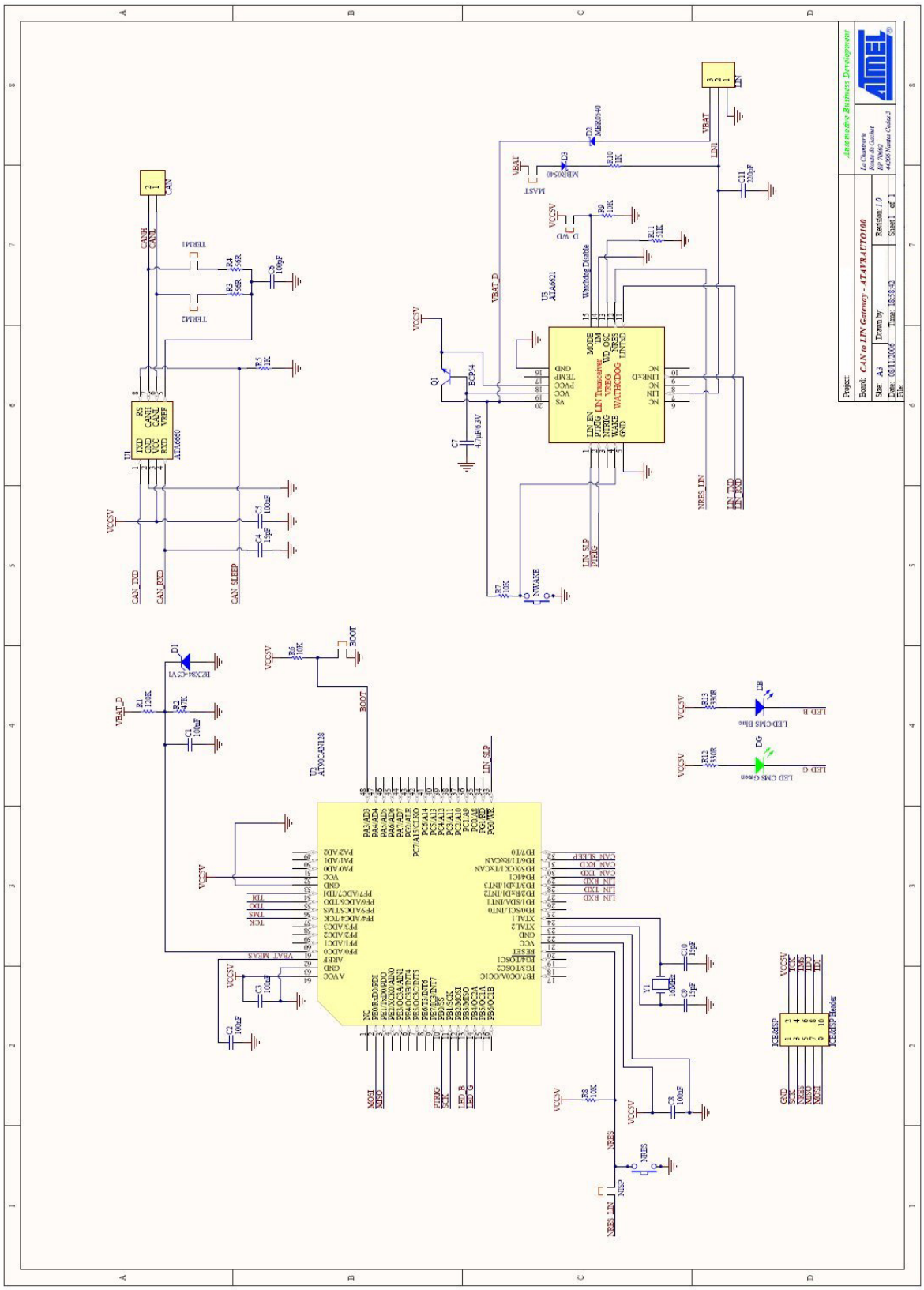


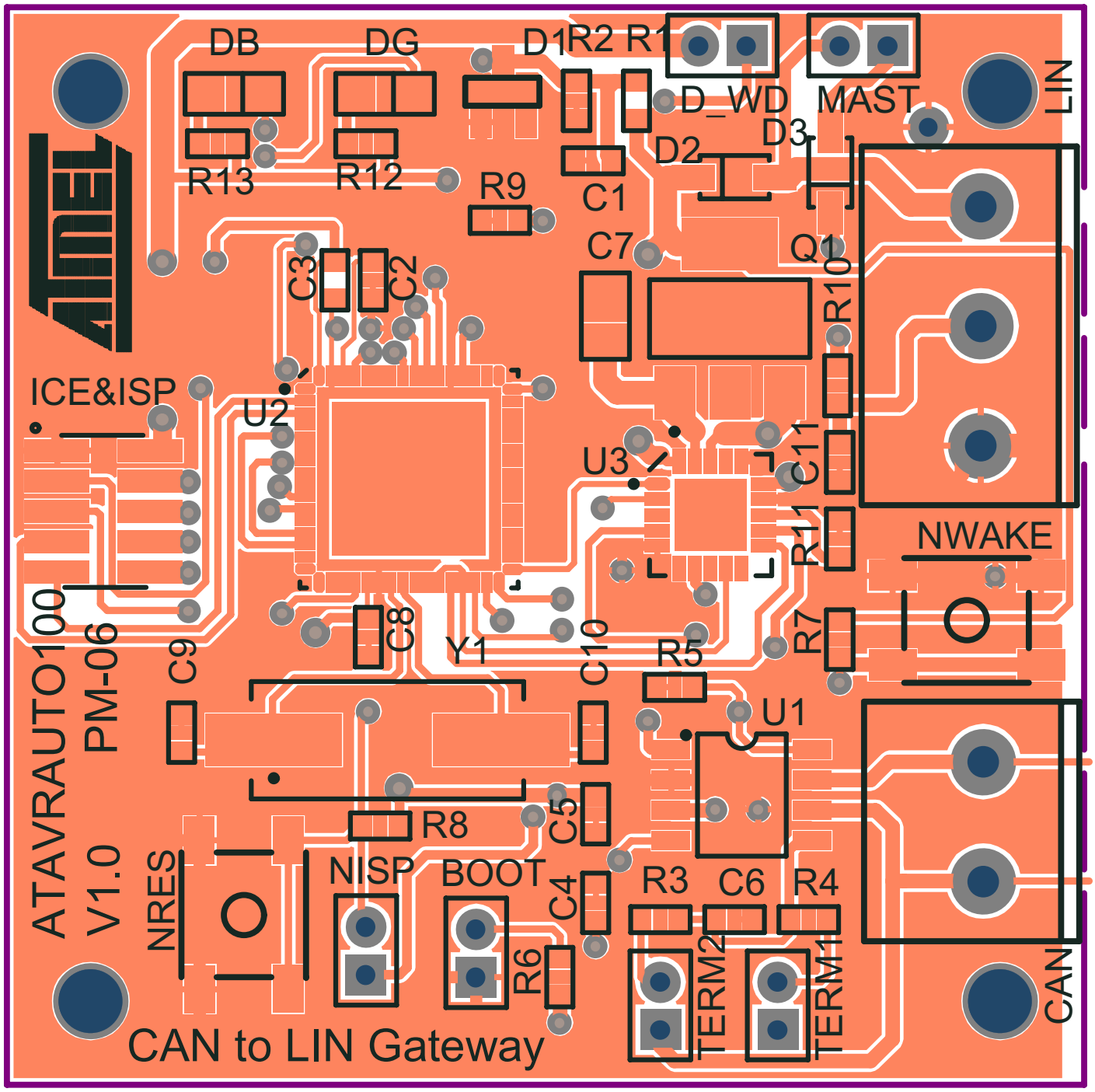
Figure 5-2. ATAVRAUTO100 Bill of materials

Bill of Materials

CAN to LIN Gateway

Designator	Descriptions	Reference	Fabricant	Quantity	Footprint
C1	100nF	X7R 16V	Phycomp	1	603
C2	15pF	COG	AVX	1	603
C3	100nF	X7R 16V	Phycomp	1	603
C4	100pF	COG	MURATA	1	603
C5	100nF	X7R 16V	Phycomp	1	603
C6	100nF	X7R 16V	Phycomp	1	603
C7	10µF	EEFCD0J100R	PANASONIC	1	Capa Tantal D
C8	22µF	T495D226K035ATE300	PANASONIC	1	Capa Tantal D
C9	100nF	X7R 16V	Phycomp	1	603
C10	15pF	COG	AVX	1	603
C11	15pF	COG	AVX	1	603
C12	220pF	X7R 50V	Phycomp	1	603
D1	TS4148	TS4148RY	Taiwan Semi	1	0805D
D2	TS4148	TS4148RY	Taiwan Semi	1	0805D
D3	LED CMS Bleue	HSMB-C170	Agilent	1	LED CMS Agilent
JP1	MPT4	MPT 0,5/4-2,54	PHOENIX CONTACT	1	CON4_2.54
JP2	MPT2	MPT 0,5/2-2,54	PHOENIX CONTACT	1	CON2_2.54
JP3	MPT3	MPT 0,5/3-2,54	PHOENIX CONTACT	1	CON3_2.54
JP4		DF17C(3.0)-20DS-0.5V(57)	HRS	1	DF17DS
MAST	2mm V	M22-2010205	HARWIN	1	embase male SIL2 verticale - pas 2mm
NISP	2mm V	M22-2010205	HARWIN	1	embase male SIL2 verticale - pas 2mm
R1	1K	RC22H	Phycomp	1	603
R2	1K	RC22H	Phycomp	1	603
R3	56R	RC22H	Phycomp	1	603

Figure 5-3. ATAVRAUTO100 assembly drawing



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